base of the growth is touched with caustic or cautery it will at times be followed by new growths of the same character.

Among the adherents of the theory of its contagiousness is Virchow, who observed the transmission of the disease from one child to another, and Tilbury Fox, who saw it spread through an entire family; but the fact that the disease may assume the dimensions of an epidemic has not often been noticed, or at least not recorded.

MELANO-SARCOMA OF THE CONJUNCTIVA OF THE EYEBALL AND OF THE CORNEA.

BY W. F. MITTENDORF, M.D.,
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THE occurrence of sarcomatous tumors of the choroid are by no means rare, but when Dr. Noyes published his cases of these growths affecting and developing on the eyeball, there were only one hundred and twenty-seven of them recorded. Since this time several cases have been added to this list by Birnbacher, Hirschberg, Mason, Ormsby and others. Melanotic tumors affecting the anterior half of the eye are the rarest of all. The growths which I had occasion to remove were of the sarcomatous kind.

August 22, 1884.—Mrs. E. Merriman, aged forty-six, a native of the State of New York, was sent to me by her family physician. In April of the same year she noticed a blackish-blue tumor on the lower half of the conjunctiva, which her doctor removed. Shorly after this there were one small tumor on the lower half and two somewhat larger ones on the upper half of the conjunctiva of the eyeball, extending from the upper cul-de-sac to within 3‴ of the corneal margin. The tumors were of the size and shape of a cucumber seed and of such a peculiar color that I suspected them to be angiomata. They were very vascular, but, as the microscopic examinat on

proved, they were not entirely made up of blood-vessels, and many of the cells contained in them contained free pigment. One or two small black spots on the conjunctiva showed a peculiar black appearance; they looked as if a drop of ink had been dropped on the eyeball and was trying to penetrate the tissues. It appeared as if the pigment was spreading from the centre to the periphery as fast as it formed. Cells taken from this part were more or less filled with a black finely granular pigment. The conjunctiva surrounding the parts was slightly congested and the eye otherwise perfectly healthy. The vision of the affected eye was almost perfect, and the refraction slightly hypermetropic. The left eye, which has not become affected up to the present time, is highly astigmatic, and its vision not near so good as that of the affected eye. The patient herself is a strong healthy woman, looking younger than she is. There is not the slightest sign of a cachexia. She does not remember that she ever received an injury to her eye, nor has she ever suffered from sore eyes or any other serious illness, and the family history is good as far as known. The pre-aural glands as well as those of the neck were perfectly healthy.

The tumors were removed at the New York Eye and Ear Infirmary under ether, and the conjunctiva brought together by means of a few sutures. The healing process was rapid and perfect, and in a few days the woman returned to her home in the country.

About four months later she returned with two growths of a similar appearance to the first ones, starting from the lower portion of the outer canthus of the same eye. They were smaller than those removed, flat and not larger than a split pea. There was also a small flat growth on the lower margin of the cornea, but not connected with the tumors at the outer corner of the eye. The growth of the cornea was about 5 mm. long and not more than 2 mm. wide; the portion near the conjunctiva was pigmented, but the upper corneal portion of it had an opaque appearance, as if the corneal epithelial layer had been lifted. This proved to be the case, for after the removal of the growth the underlying corneal tissue ap-

peared not affected, her vision had not suffered and the cornea is at the present time perfectly clear, showing hardly any cloudiness at the seat of the former growth. After removing all the tumors as carefully as possible, the patient returned home, and for nearly a year I heard nothing from her.

In the spring of this year she returned with her eye almost closed. On examination this was found to be due to a flat tumor, of the size of a small cherry, that had developed from the scar of one of the former growths, and pushed in between the conjunctiva and tarso-orbital fascia. The orbit was not invaded, and the conjunctiva appeared perfectly healthy, except that at the inner canthus it had a swollen and red appearance. This portion as well as the tumor of the lid was carefully removed. It was found at this visit that the pre-aural gland and several glands of the neck were slightly enlarged; however, the general health of the patient remained good all the time, in fact she looked better than she ever did before, and had gained in weight since her last visit.

About four or five weeks later she returned on account of the rapid increase of the size of the upper lid. It was found that a new growth had started near the location of the former, and was so large that the lid could not be turned. I separated, therefore, the upper lid from the orbital margin, removed the tumor, and sewed the lid back to its place. The wound healed rapidly and looked very well when she left, but the ptosis was still marked. The glandular enlargement was more marked and at times a little painful. The cornea, however, was perfect, and the conjunctiva almost so, with the exception of two small black spots of the size of the head of a pin. They were of course removed. Sections of the latter, showing the pigmented cells, I expected to be able to show to you to-day, but they were taken out west by mistake, by the pathologist of the Infirmary, who reports to me as follows:

DETROIT, JULY 8, 1886.

DEAR DOCTOR,—The growths which you removed from the conjunctiva of Mrs. Merriman were sarcomata, composed mainly of medium-sized roundish cells in a but slightly defined stroma. The melanotic appearance of the nodules was chiefly due to

hæmorrhages into the parenchyma, the red blood cells retaining their form and betraying beginning disorganization only by their color. In some parts, however, particularly in the smaller nodules, the tumor cells contained pigment granules in considerable quantities, presenting, in short, the ordinary appearances of melano-sarcomata. Sincerely, H. GIFFORD.

It would be interesting to know whether the hæmorrhages and the following degenerative changes of the blood-vessels, which were noticed at the periphery of the very small growths, are part of the process or only accidental, and due to the endothelial degeneration in the interior of the blood-vessels. I had been in hopes to save the eye and the patient, but it appears doubtful on account of the rapid reformation of the growths and the glandular infiltrations.

DISCUSSION.

DR. KNAPP.—I would ask Dr. Noyes what was the result in the case which he reported.

DR. NOYES.—For the four years that my case was under observation there was no return of the growth. Of late years he has passed from observation.

In another case of epithelial growth of the conjunctiva on which I operated there has been no return for six years. The first case was one of melano-sarcoma.

DR. KNAPP.—I have seen a number of these growths which I have removed as carefully as possible, but they have all relapsed, the period varying in different instances.

DR. WADSWORTH.—In two cases of small episcleral epithelioma, one removed by myself, the other seen in consultation, the growth had not returned at the end of several years.

DR. RANDALL.—It might not be without interest to mention a case of melano-sarcoma which I referred to Jæger's clinic. The growth was as large as the eyeball, but pedunculated, so that its base did not measure more than four or five millimetres. As the base was gradually getting smaller, I am of the opinion that it eventually might have fallen off. The pre-aural glands were involved and the conjunctiva was blackened in the peculiar manner mentioned.

I have seen two other cases, of alveolar sarcoma with no great amount of pigment, which involved the limbus solely. In a third case both the cornea and conjunctiva were involved.

DR. LIPPINCOTT.—Some years ago, I removed a similar

growth involving the margin of the cornea. The tumor had invaded the wall of the eyeball to such an extent that I deemed it advisable to remove the globe, although vision was almost perfect. Enucleation was accordingly performed, and the disease has not returned.

THE EQUIVALENCE OF CYLINDRICAL AND SPHERO-CYLINDRICAL LENSES.

By EDWARD JACKSON, M.D.,
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RECENT discussion as to the use of cylindrical lenses has revealed that some are disposed to employ two cylindrical surfaces where one would be preferable. In view of this, and because the propositions in question are capable of other applications of practical importance, it seems worth while to record the following demonstrations. These demonstrations apply within the same limits and with the same approximation to accuracy, as the demonstrations and formulæ in common use for spherical and cylindrical lenses. That is, the lenses are supposed to be so thin that they may, without serious error, be regarded as superimposed in the same plane; and their spherical aberration so slight that it may be disregarded; while the pencil of incident rays emanates from a point in, or sufficiently near, the principal axis of the lens system.

PROPOSITION I.—*Equal crossed cylinders are optically equivalent to a spherical lens of the same focal length.*[1] If two equal cylindrical lenses C′ and C″ are superimposed with their axes perpendicular to one another, the axial plane of each lens will be perpendicular to the axis of the other. Since a cylindrical lens does not affect the direction of incident rays with refer-

[1] The *axial plane* of a cylindrical lens is the plane which passes through the geometrical axis of the cylindrical surface, and the middle of that surface. The line in which it cuts that surface is called the *axis* of the cylindrical lens. Where cylindrical lenses are superimposed the intersection of their axial planes constitutes the *principal axis* of the lens system. Cylindricial lenses superimposed with their axial planes, and therefore their axes, perpendicular to one another, are called *crossed cylinders*.